

Complete Summary

GUIDELINE TITLE

Preventing lead poisoning in young children.

BIBLIOGRAPHIC SOURCE(S)

Centers for Disease Control and Prevention (CDC). Preventing lead poisoning in young children. Atlanta (GA): Centers for Disease Control and Prevention (CDC); 2005 Aug. 101 p. [139 references]

GUIDELINE STATUS

This is the current release of the guideline.

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SCOPE

DISEASE/CONDITION(S)

Lead poisoning (blood lead levels of greater than or equal to 10 micrograms/dL)

GUIDELINE CATEGORY

Evaluation
 Prevention
 Risk Assessment
 Screening

CLINICAL SPECIALTY

Family Practice
 Internal Medicine

Pediatrics
Preventive Medicine

INTENDED USERS

Advanced Practice Nurses
Allied Health Personnel
Nurses
Physician Assistants
Physicians
Public Health Departments

GUIDELINE OBJECTIVE(S)

To guide public health practice and policy development and review necessary steps to ensure progress toward meeting the 2010 goal of eliminating elevated blood lead levels in children

TARGET POPULATION

Children aged 1-5 years

INTERVENTIONS AND PRACTICES CONSIDERED

1. Blood lead level screening programs (especially targeted to high-risk populations)
2. Parental education on means to decrease lead exposure
3. Advocacy for lead-safe housing
4. Promotion of lead-safe work practices

MAJOR OUTCOMES CONSIDERED

- Blood lead levels
- Incidence of lead poisoning
- Cognitive function and intelligence, as measured by intelligence quotient (IQ) or General Cognitive Index (GCI)
- Other health outcomes, including neurodevelopment, behavior, growth or stature, sexual maturation, dental caries, hearing, renal function, blood pressure, heme synthesis, hematopoiesis, and Vitamin D metabolism in relation to blood lead levels

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Hand-searches of Published Literature (Primary Sources)
Hand-searches of Published Literature (Secondary Sources)
Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

Literature Search

To identify potentially relevant articles, a comprehensive report published by the Agency for Toxic Substances and Disease Registry (ATSDR) was reviewed first to identify cited articles that related to low-level lead exposure in children. The list of potentially relevant citations identified in the ATSDR report was supplemented by three computerized literature searches, using Dialog® to search Medline, Toxfile, and other bibliographic databases. Search terms (see Appendix A of the original guideline document) were chosen to identify articles reporting on blood lead measurements and one or more domains of health related to lead exposure including neurodevelopment, cognitive function, intelligence, behavior, growth or stature, hearing, renal function, blood pressure, heme synthesis, hematopoiesis, and Vitamin D metabolism. The first search spanned articles published from 1995 through 2002 and indexed as of September 2002, the month and year that the initial search was performed. The second search was performed in April 2003 and spanned the period 2002 through the search date. A third search, spanning the years 1990 through 1996, was performed when a relevant article not cited in the ATSDR toxicological profile was identified by one of the work group members. In addition, potentially relevant articles were identified by work group members and through citations in articles identified previously.

Abstracts were reviewed initially. If they were ambiguous or if they suggested the article was relevant, full articles were checked for relevance. Articles deemed relevant were abstracted for this report. Appendix A of the original guideline document summarizes the number of possibly relevant references identified, full articles checked for relevance, and relevant articles abstracted and considered in the review.

Criteria for Relevant Studies

The following criteria were used to select relevant studies to review for this report:

1. Blood lead levels (BLLs) were measured using graphite furnace atomic absorption spectrophotometry (GFAAS) or anodic stripping voltametry.
2. The study was published in English.

In addition, for studies in which intelligence quotient (IQ) or General Cognitive Index (GCI) was a measured outcome, the study analyses included an assessment of the association between BLLs measured in children and IQ or GCI. For studies in which IQ or GCI was not a measured outcome, the study analyses included an assessment of the association between BLLs <10 micrograms/dL measured in children and a health outcome. The assessment could either be formal (e.g., non-linear modeling, linear modeling restricted to populations with all or at least 95% of children having BLLs <10 micrograms/dL, statistical comparison of two or more sub-groups with BLLs < 10 micrograms/dL) or informal (e.g., graphical display of results permitting visual assessment of blood lead--outcome relation in the range <10 micrograms/dL).

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Expert Consensus

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Not applicable

METHODS USED TO ANALYZE THE EVIDENCE

Review of Published Meta-Analyses
Systematic Review with Evidence Tables

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Structured Abstracts

For each relevant study, a structured study abstraction was performed that captured the following information: the study location, sample size, age at which blood lead was measured, age at which the outcome was measured, available information about the blood lead distribution (including mean or other measure of central tendency, variance, and percent of participants with blood lead levels [BLLs] <10 micrograms/dL), the crude and adjusted regression coefficients relating blood lead to outcome (if available), the type of model fit (linear, log linear, or other), and the covariates included in the adjusted model. If regression coefficients were not available, other measures of association reported (e.g., correlation coefficients) were noted. Because some studies fit multiple blood lead-outcome models (e.g., cohort studies with blood lead and intelligence quotient [IQ] measured at multiple ages), relevant information about each model estimated was abstracted. For IQ studies, covariates measured and not included in adjusted models were recorded when available.

Review of Cohort Study Methods

Among relevant published results were those from cohort studies specifically designed and conducted to study the relation of BLLs to children's cognitive function and other health outcomes. Because these studies had the strongest and best-documented study designs for this review, methods used for blood lead measurement and neuropsychological assessment were summarized for these studies. This information was collected from published studies; in some cases, the studies were supplemented by information provided through correspondence with the investigators.

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

In March 2002, the Centers for Disease Control and Prevention (CDC) Advisory Committee on Childhood Lead Poisoning Prevention (ACCLPP) established a work group (WG) to review the available evidence of possible health effects of blood lead levels (BLLs) of below 10 micrograms per deciliter (micrograms/dL), the level of concern currently established by CDC.

Scope and Approach

Given the charge to the work group and the scientific and public health context, the WG did not attempt a comprehensive review of all evidence relating lead exposure to health. Instead, the WG set out to answer the following questions:

1. Does available evidence support negative associations between health indicators and children's blood lead levels measured <10 micrograms/dL?
2. Are the observed associations likely to represent a causal effect of lead on health?

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

The Advisory Committee on Childhood Lead Poisoning Prevention (ACCLPP) reviewed the document and it was revised based on their comments. The majority of ACCLPP members accepted the findings of the report, with two members dissenting.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

Recommendations to health-care providers and community-based health and social service agencies are given below (refer to original guideline document for recommendations for federal, state, and local agencies).

The Centers for Disease Control and Prevention (CDC) recommends that health care providers continue their traditional role of providing anticipatory guidance as part of routine well-child care, assessing risk for exposure to lead, conducting blood lead screening in children, and treating children identified with elevated blood lead levels (BLLs). In addition health-care and social service providers are

urged to expand their roles. They should keep abreast of research data that clarify the relationship between lead exposure and neurocognitive development in children. They also can strongly advocate for children and foster lead exposure prevention by helping facilitate implementation of the specific strategic plans to eliminate childhood lead poisoning in their local and state communities. Health-care and social service providers are highly effective child advocates, and their active participation in the process provides the expertise and leadership needed to reach this goal. Health-care and social service providers should:

1. Provide culturally appropriate education to all pregnant women and to families with young children about the principal sources of lead and ways to reduce exposure.
2. Target outreach, education, and screening programs to populations with the greatest risk for lead exposure.
3. Become aware of, and actively support, lead poisoning elimination efforts in the community.
4. Express concern to federal, state, and local policy and decision makers that children live in a lead-safe environment and actively support legislation and regulatory initiatives. Advocate for lead-safe, affordable housing by supporting appropriate legislation.
5. Become aware of and comply with lead screening policies issued by Medicaid or state and local health departments.
6. Ensure training of staff members engaged in housing renovation or rehabilitation in lead-safe work practices.

CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of supporting evidence is not specifically stated for each recommendation.

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

- Identification of increased lead levels in high-risk children enabling appropriate treatment interventions to reduce blood lead levels
- Identification of the source of lead poisoning enabling the prevention of further lead exposure
- Reduction in the incidence of lead poisoning in high-risk children

POTENTIAL HARMS

Not stated

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

Observational studies have inherent limitations--not specific to studies of lead toxicity--with the potential to produce biased results. Biases from observational studies can obscure true causal effects of toxicant exposures or produce associations between toxicant exposures and health status when no causal relation is present. Thus, statistical associations from individual observational studies or multiple studies subject to similar biases cannot establish causal relationships; additional, non-statistical criteria may be used to evaluate such evidence. Although causal criteria have been stated in various ways, the Surgeon General's Report on Smoking and Health (U.S. Public Health Service 1964) provides a useful set of criteria. They include:

- The consistency of the association
- The strength of the association
- The temporal relationship of associated variables
- Coherence of the association

The application of these criteria does not provide a clear demarcation for concluding definitive proof of causation versus inadequate evidence. Rather, the more the available evidence meets these criteria, the greater the confidence in causal inference about an association. Consistent with these criteria, the work group identified several issues specifically relevant to inferring causality from associations (or the lack of associations) of blood lead levels (BLLs) to health measures observed in studies of low-level lead exposure. These potential biases are not unique to studies of children with BLLs <10 micrograms/dL. However, the larger number of human and experimental animal studies (including primate studies) and the nature of observed health effects associated with higher BLLs have conclusively demonstrated the adverse health effects of lead. However, far fewer studies of possible health effects of BLLs <10 micrograms/dL have been conducted, and the relative importance of some sources of bias may be greater at these lower levels. Therefore, the work group considered several issues in interpreting the findings of available studies (see Discussion in the original guideline document).

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Staying Healthy

IOM DOMAIN

Effectiveness
Patient-centeredness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Centers for Disease Control and Prevention (CDC). Preventing lead poisoning in young children. Atlanta (GA): Centers for Disease Control and Prevention (CDC); 2005 Aug. 101 p. [139 references]

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

2005 Aug

GUIDELINE DEVELOPER(S)

Centers for Disease Control and Prevention - Federal Government Agency [U.S.]
Department of Health and Human Services (U.S.) - Federal Government Agency [U.S.]
Public Health Service (U.S.) - Federal Government Agency [U.S.]

SOURCE(S) OF FUNDING

United States Government

GUIDELINE COMMITTEE

Advisory Committee on Childhood Lead Poisoning

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FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

GUIDELINE STATUS

This is the current release of the guideline.

GUIDELINE AVAILABILITY

Electronic copies: Available in Portable Document Format (PDF) from the [Centers for Disease Control and Prevention \(CDC\) Web site](#).

Print copies: Available from the Centers for Disease Control and Prevention, MMWR, Atlanta, GA 30333. Additional copies can be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402-9325; (202) 783-3238.

AVAILABILITY OF COMPANION DOCUMENTS

The following is available:

- Recommendations for blood lead screening of young children enrolled in Medicaid: targeting a group at high risk. MMWR Recomm Rep 2000 Dec 8; 49(RR-14):1-13.

Electronic copies: Available from the Centers for Disease Control and Prevention Web site:

- [HTML Format](#)
- [Portable Document Format \(PDF\)](#)

Print copies: Available from the Centers for Disease Control and Prevention, MMWR, Atlanta, GA 30333. Additional copies can be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402-9325; (202) 783-3238.

PATIENT RESOURCES

None available

NGC STATUS

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